

EXHIBIT C

IMMUNOLOGY

A Short Course

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ELEMENTS OF IMMUNITY

INTRODUCTION

Every living organism is confronted by continual assaults from its environment. To survive, every organism has therefore had to develop defenses that render it resistant, or immune, to such assaults. These defenses range from physical barriers, such as a cell wall, to highly sophisticated systems, such as the acquired immune response. This chapter describes the defense systems: the elements that constitute the defense, the participating cells and organs, and the action of the participants in the immune response to foreign substances that invade the body.

In vertebrates, immunity against microorganisms and their products is divided into two major categories: *innate or natural immunity*, and *acquired immunity* (Fig. 2.1). These two types of immunity, their origins, and their components are discussed in the paragraphs that follow.

INNATE OR NATURAL IMMUNITY

Innate (natural) immunity is present from birth and consists of many factors that are relatively nonspecific; i.e. they operate against almost any substance that threatens the body. Some of the important non-antigen-specific factors that are part of innate immunity are given below.

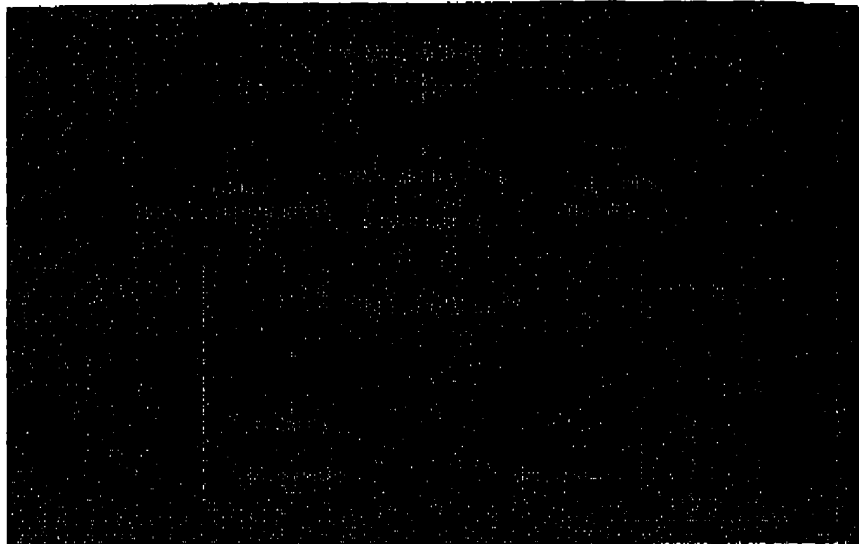


Figure 2.1.
The relationship between
innate and acquired immu-
nity.

Physiologic Barriers (Skin and Mucous Membranes)

Most organisms cannot penetrate intact skin, although they can enter the body if the skin is cut. Some microorganisms can enter the body through sebaceous glands and hair follicles. However, the *acid pH* of sweat and sebaceous secretions, the presence of various *fatty acids* and of *enzymes* (e.g. lysozyme), all of which have some antimicrobial effect, minimize the importance of this route of infection.

Mucus covers the surface of many areas in the body, such as the respiratory and the gastrointestinal tracts. In the respiratory tract, the mucus and any microorganisms trapped in it are constantly being driven upward by ciliated cells, toward the external openings. Also, the hairs in the nostrils and the cough reflex are helpful in preventing organisms from infecting the respiratory tract. Alcohol, cigarette smoke, and narcotics suppress this entire defense system.

The elimination of microorganisms from the respiratory tract is aided by pulmonary or alveolar macrophages, which are phagocytic cells able to destroy